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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is also included.

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TECHNICAL REPORT
ON
STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY
FOR

SALESMAN, CONSTRUCTION MACHINERY (whole tr.) 1-86.26

B-483

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U. S. Employment Service in
Cooperation with
California, Colorado, Idaho, Oregon, Utah
and Washington State Employment Services

January 1963

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STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

SALESMAN, CONSTRUCTION MACHINERY 1-86.26

B-483

Summary

The General Aptitude Test Battery, B-1002A, was administered to a final sample of 113 men employed as Salesmen, Construction Machinery 1-86.26 by 37 companies located in the six Western States of Utah, Idaho, Colorado, California, Washington and Oregon. The criterion consisted of supervisory ratings. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes G-Intelligence, V-Verbal and S-Spatial were selected for inclusion in the final test norms.

GATB Norms for Salesman, Construction Machinery 1-86.26 B-483

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1- H CB-1- I CB-1- J	105	G	Part3 Part4 Part6	100
V	CB-1- J	95	V	Part4	95
S	CB-1- F CB-1- H	110	S	Part3	105

Effectiveness of Norms

The data in Table IV indicate that 22 of the 35 poor workers, or 63 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 63 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 53 of the 66 workers who made qualifying test scores, or 80 percent, were good workers.

TECHNICAL REPORT

I. Purpose

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Salesman, Construction Machinery 1-86.26.

II. Sample

The experimental sample of 167 males was drawn from workers employed by 42 construction equipment dealers located in the six Western States of Utah, Idaho, Colorado, California, Washington, and Oregon. The GATB, B-1002A, was administered to this sample during the period April 4, 1955 to January 21, 1959. The composition of the experimental sample was as follows:

<u>State</u>	<u>Number of Workers Tested</u>	<u>Firms</u>
California	31	4
Colorado	24	7
Idaho	10	3
Oregon	22	8
Utah	43	8
Washington	37	12
	167	42

From this tested sample, 54 workers were eliminated for the following reasons; overage 6, insufficient experience 13, job duties different 12, other test data incomplete 15, other test data invalid 2, criterion data incomplete 1 and criterion data invalid 5. The final validation sample consisted of 113 employed Construction Machinery Salesmen from 37 different company locations in the above six Western States.

Workers in this occupation are hired according to individual company selection procedures and entrance requirements which vary from employer to employer. Some companies hire only trainees, others hire only men with 2 or 3 years' sales experience (not always in the equipment field), and still others hire either inexperienced or experienced workers. Sometimes workers within the company itself are transferred into sales from the shop, accounting, parts, or order departments. Educational standards also differ from company to company. Sometimes there is no set amount of education imposed other than the ability to speak, read and write English. In contrast to this, some companies require completion of high school; and others prefer various amounts of college training, at times indicating the desirability of an engineering background.

The final sample was a mature, highly experienced, and relatively well-educated group of men. Average age at the time of testing was slightly over 40 years and ranged between 23 and 54 years. On the average these salesmen had a little better than one year of college with an actual range in education from 7 to 17 years. Average company experience was approximately 5½ years, although a few salesmen had just recently become associated with their current employers. This is indicated by the fact that company experience ranged from 3 to 319 months. Total experience in the occupation averaged about 9½ years, but ranged from 30 to 319 months. Six months is considered the minimum training period for this occupation.

TABLE I

Means (M), Standard Deviations (σ), Ranges and Pearson Product-Moment Correlations with Criterion (r) for Age, Education, Company Experience and Total Experience Salesman, Construction Machinery 1-86.26

N = 113

	M	σ	Range	r	
				A.	B.
Age (Years)	40.2	7.6	23-54	-.154	-.146
Education (Years)	13.3	2.0	7-17	.045	.071
Company Experience (Months)	66.2	53.6	3-319	.088	.012
Total Experience (Months)	114.0	68.2	30-319	-.011	-.070

There are no significant correlations between the criterion and the variables of age, education or experience. Therefore, the sample for this study is suitable for USES test development purposes.

III. Job Description

Job Title: Salesman, Construction Machinery (whole tr.) 1-86.26

Job Summary: Sells a variety of products of assigned sales lines of construction, mining and industrial machinery, equipment and supplies to old and new customers within a designated sales territory. Presents sales story to sales prospect, creating buying interest by following an appropriate sales approach, using on-job demonstrations and visual aids, and applying his knowledge of the prospect, the prospect's needs, and products of assigned sales lines. Closes the sale and prepares order or contract for items purchased. Promotes and maintains good public relations with customers and increases sales potential by developing new accounts. Works with considerable independence within the limits of established company policies and procedures.

Work Performed: Learns selling points of products of assigned sales lines: Studies manufacturer's literature for specifications of products of assigned and competitive sales lines. Observes equipment in operation on job site and talks with trained operators. Learns to operate equipment himself, but usually does not become a trained operator. Obtains product information from other salesmen who have had greater experience. Solicits customer comments. Consults with Sales Manager or other appropriate personnel of company where employed. Derives information from sales experience.

Obtains knowledge of sales prospect and his business: Builds up knowledge of sales prospect through personal contact with him, the prospect's friends, or other informed persons. Uses reports from financial service to increase mass of data about sales prospect. Visits job site and gains insight into activities of the firm in question through personal observation of operations and face-to-face contacts with management and supervisory personnel.

Plans sales activities: Organizes sales activities among old and new contacts. Utilizes all available sources of sales prospect information when making his plans. Obtains assistance of appropriate company personnel such as Sales Manager or Service Manager whenever necessary.

Promotes good public relations: Applies principles of courtesy and good taste when making sales contacts. Exercises care in providing or accepting customer entertainment and personal favors to avoid creating an atmosphere of undue familiarity or sense of personal obligation. Establishes customer confidence in company represented and products of assigned sales lines through consciously maintaining his business integrity. Develops good working relationship with customers by providing dependable service and using existing opportunities to be genuinely helpful. Attempts to "sell" his company as well as his sales lines. Uses "hand-outs" to keep sales prospects conscious of his firm and its products.

Presents his sales story: Applies his knowledge of the sales prospect, the prospect's business, and products of his assigned sales lines when narrating his sales story. Uses individual approach for each selling situation. Tells prospect about products of assigned sales lines. Refers to sales manuals for product information. Illustrates his sales story with visual aids, using such devices as manufacturer's literature, films, charts, diagrams or pictures. Arranges demonstration of equipment by company operator in company yard or on prospect's work site. Lets prospect operate equipment. Relates uses, advantages, potential savings, construction features and operating methods of products to needs of the sales prospect. Plants ideas in mind of prospect which will lead to purchase. Furnishes purchase data such as description of items, delivery date, price, and terms on quotation form or through proposal. Alters prepared sales plan to meet changing tempo of sales interview.

Closes the sale: Uncovers objections of prospect and gives them satisfactory answers. Turns negative reactions into plus values or renders them non-effective. Recognizes difference between valid and invalid reasons given by sales prospect for lack of buying interest. Senses tenor and degree of prospect reaction and adapts his sales approach to meet each changing situation. Breaks down sales resistance by integrating and applying his knowledge of the prospect, his knowledge of products of assigned sales lines and his knowledge of the prospect's needs. Aids sales prospect in determining job methods and specific equipment to use for his particular operation. Uses prepared tables to estimate operating potential or personally calculates such data as construction grades, fuel consumption, running speed of equipment, amount of material handled per unit and available working time. Presents best financial arrangement in keeping with prospective buyer's ability to pay including trade-in value of used equipment. Uses applicable "lead-ups" to close the sale. Takes orders for equipment and prepares appropriate documents showing essential purchase information for cash or credit sales.

Records and reports sales activities: Jots down sales activities in daily date book. Summarizes sales activity information on standard company call report (showing names and addresses of firms contacted, individuals seen, types of contacts made, subjects discussed, sales made the dates of next calls) and submits same to employer. Maintains personal book or card file of call-back information for each sales prospect or uses standard company call reports for this purpose. Makes periodic expense and travel reports to employer indicating such items as place and cost of lodging, cost of meals, car expenses, towns visited and total miles driven.

Makes suggestions for improving company operations: Recommends new lines for distribution to Sales Manager for his study and evaluation. Considers individual and company problems during regular sales meetings and offers suggestions for their solution. Presents ideas for improving company policies and procedures.

Performs other related duties as assigned: Performs other related duties as assigned such as maintaining sales manuals, making preliminary contacts for collecting delinquent accounts, helping other salesmen to develop sales plans and close a sale, and assisting in company training programs.

IV. Experimental Battery

All the tests of the GATB, B-1002A, were administered to the sample group.

V. Criterion

The criteria consisted of supervisory ratings made with two descriptive rating scales. The first scale was designated as Criterion A (Aptitudes), and the second as Criterion B (Personality Traits). Criterion A consisted of 11 items prepared to cover aspects of the job which were likely to be related to measures of aptitudes such as job proficiency, quantity of production, quality of production and ability to "catch on" to various stages of the job. Criterion B was a 12-item scale prepared to cover personality and interest traits such as cooperativeness, dependability, integrity, and ability to get along with others. Each item included five responses for rating purposes. The five categories were unnumbered and unlettered to eliminate as much association with criterion scores as possible.

Supervisory ratings were obtained on members of the experimental sample during the period September 16, 1958 to April 23, 1959. Ratings were made by the one supervisor who was considered to know best the abilities and characteristics of all salesmen in his company. In most instances this supervisor was the Sales or Branch Manager. After receiving standard rating instructions, raters were given the appropriate group of rating sheets--one question at a time. Ratings were begun with Criterion A (Aptitudes). This first rating was followed in order by the first rating with Criterion B, the second rating with Criterion A, and the second rating with Criterion B. A minimum interval of one week was maintained between each set of ratings. All ratings were reconsidered at least 24 hours after their initial completion, and any necessary adjustments were made at that time by the original rater.

The reliability of each criterion was determined by computing Pearson Product-Moment correlation coefficients between first and second ratings for Criterion A (Aptitudes) and for Criterion B (Personality Traits). Obtained reliability coefficients were .88 for Criterion A and .85 for Criterion B. The two sets of ratings for each criterion were then combined. The range of combined Criterion A scores was 40-100, with a mean of 73.0 and a standard deviation of 13.6. The range of combined Criterion B scores was 63-114, with a mean of 92.6 and a standard deviation of 12.2. The combined scores for Criterion A and Criterion B correlated .80. Therefore, each salesmans relative job performance was judged to be about the same from the standpoint of Criterion A (Aptitudes) and Criterion B (Personality Traits). Criterion A was selected as the final criterion for the study since the components of this criterion would more likely be predicted by GATB performance.

VI. Qualitative and Quantitative Analyses

A. Qualitative Analysis:

The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation:

Intelligence (G) - required to know company policies and procedures; to learn specifications, operating methods, prices, and selling points of products of assigned and competitive sales lines.

Verbal Aptitude (V) - required to read and understand sales manuals and manufacturers's literature on products of assigned sales lines; to apply principles of courtesy, tact, and good taste when making personal contacts.

Numerical Aptitude (N) - required to interpret prepared tables to estimate operating potential of equipment and determine best financial arrangement for prospective buyer.

Clerical Aptitude (Q) - required to prepare appropriate documents showing essential purchase information for cash or credit sales; to maintain file of call back information on sales prospects; to summarize and report daily sales activities; and to complete periodic expense and travel reports.

On the basis of the job analysis data the following aptitudes are considered as irrelevant for successful performance of the job: K-Motor Coordination, F-Finger Dexterity and M-Manual Dexterity.

B. Quantitative Analysis:

TABLE II

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N = 113

Aptitudes	M	σ	r	
			A	B
G-Intelligence	113.1	14.2	.316**	.293**
V-Verbal Aptitude	109.2	13.7	.194*	.149
N-Numerical Aptitude	106.9	14.0	.291**	.246**
S-Spatial Aptitude	111.3	17.1	.229*	.215*
P-Form Perception	100.1	16.1	.151	.036
Q-Clerical Perception	104.0	15.0	.172	.076
K-Motor Coordination	102.4	15.8	.219*	.206*
F-Finger Dexterity	96.0	18.6	.179	.184
M-Manual Dexterity	98.0	21.8	.149	.184

** Significant at the .01 level

* Significant at the .05 level

C. Selection of Test Norms:

TABLE III

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X	X	X			X			
Irrelevant							X	X	X
Relatively High Mean	X	X		X					
Relatively Low Sigma	X	X	X						
Significant Correlation with Criterion A	X	X	X	X			X		
Aptitudes to be Considered for Trial Norms	G	V	N	S					

Trial norms consisting of various combinations of Aptitudes G, V, N, and with appropriate cutting scores were evaluated against the criterion by the tetrachoric correlation technique. A comparison of the results showed that B-1002 norms consisting of G-100, V-95 and S-105 had the best selective efficiency.

VII. Validity of Norms (Concurrent)

The validity of the norms was determined by the tetrachoric correlation between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing 31 percent of the sample in the low criterion group because this percent was considered to be the unsatisfactory or marginal workers.

Table IV shows the relationship between test norms consisting of Aptitudes G, V and S with critical scores of 100, 95, and 105, respectively, and the dichotomized criterion for Salesman, Construction Machinery 1-86.26 Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Validity of Test Norms for Salesman, Construction Machinery 1-86
(G-100, V-95, S-105)

N = 113	Non-Qualifying Test Scores		Qualifying Test Scores	Total
	Good Workers	Poor Workers	Total	
	25	22	53	78
	47	13	66	35
			113	

$$r_{tet} = .47$$

$$r_{tet} = .16$$

$$\chi^2 = 8.212$$

$$p/2 < .005$$

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conclusions

On the basis of the results of this study, Aptitudes G, V and S with minimum scores of 100, 95, and 105, respectively, have been established as B-1002 norms for Salesman, Construction Machinery 1-86.26 The equivalent B-1001 norms consist of G-105, V-95 and S-110.

IX. Determination of Occupational Aptitude Pattern

The specific norms established for this study did not meet the requirements for allocation to any of the existing 35 OAP's (revised 10/61). The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.